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ABSTRACT

This digest describes and defines the various components of an expert system, e.g., a computerized tool designed to enhance the quality and availability of knowledge required by decision makers. It is noted that expert systems differ from conventional applications software in the following areas: (1) the existence of the expert systems shell, or interpreter; (2) the presence of a "knowledge base," or system of related concepts that enables the computer to approximate human judgment; and (3) the sophistication of the user interface. The purpose and functions of these three concepts are discussed in detail, and the computer's operating system is defined in terms of its important role in the implementation of the expert system. Eight additional readings are suggested. (MAB)

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What Is an Expert System?

by Richard W. Boss

Expert systems are computerized tools designed to enhance the quality and availability of knowledge required by decision makers in a wide range of industries. They augment conventional programs such as databases, word processors, and spreadsheet analysis. Expert systems differ from conventional applications software in the following ways:

- The expert system shell, or interpreter.
- The existence of a "knowledge base," or system of related concepts that enable the computer to approximate human judgment.
- The sophistication of the user interface.

The Expert System Shell

While any conventional programming language can be used to build a knowledge base, the expert system shell simplifies the process of creating a knowledge base. It is the shell that actually processes the information entered by a user; relates it to the concepts contained in the knowledge base; and provides an assessment or solution for a particular problem. Thus, an expert system shell provides a layer between the user interface and computer operating system to manage the input and output of data. It also manipulates the information provided by the user in conjunction with the knowledge base to arrive at a particular conclusion. The structure of the shell is very similar to that of an interpreter or a front-end to a database program. The shell also manages the user interface, performing functions that range from the validation of numeric values entered on the screen to management of the mouse and the representation of graphical objects.

The shell is often sold as an end-product, allowing the purchaser to encode a knowledge base from scratch the same way a user would purchase a database management system. On the other hand, knowledge bases can be sold as products—where a shell or interpreter may be an incidental part of the package—in the same way a user might buy data.

The Knowledge Base

The main purpose of the knowledge base is to provide the guts of the expert system—the connections between ideas, concepts, and statistical probabilities that allow the reasoning part of the system to perform an accurate evaluation of a potential problem. Knowledge bases are traditionally described as large systems of "if then" statements, but this description is misleading because knowledge bases may not contain definitive rules at all, but may contain only associative relationships among different concepts, statistical information about the probability of certain solutions, or simply large databases of facts that can be compared to one another based on simple conventions intrinsic to the expert system.

The User Interface

For the last several years, interface designs for expert systems have hinged on graphical capabilities and unconventional methods of entering data into the system. For example, many expert systems used a mouse for data entry well before the Macintosh became popular. Graphical interfaces can supply information in any number of forms: simple text "dressed up" in windows, pop-up menus, or actual graphical objects. Recently, many of those formats have been integrated into conventional applications, but they are of particular use in expert systems. An expert system may express an idea, solution, or explanation using more complex conventions than rows of numbers, pie charts, or brief messages.

The Operating System

The computer's operating system plays an important role in the implementation of an expert system. The operating system provides the basic capabilities of the machine to the expert system, including file management, some user interface support, memory management, and interfaces to other products that might be wanted to share information that is contained in the expert system. The operating system's resources and utilities may intrinsically provide needed capabilities (for example, graphic or mouse support and database management) that, therefore, ease the need for additional programming. In some cases, the operating system may even provide conventions for interfacing the expert system to other programs. The disadvantage of using the operating system's facilities is the limited control the developer has over the facilities and likely

performance degradation. For example, in the PC environment, OS/2 and Presentation Manager provide much better interface support than DOS.

The purpose of the expert system is to enhance judgment on the part of the user, not to replace human judgment altogether. Expert systems can provide a relatively inexperienced user with a lucid assessment of a problem where an expert is unavailable.

Additional Readings

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